Modelling Railway-Induced Passenger Delays in Multi-Modal Public Transport Networks: An Agent-Based Copenhagen Case Study Using Empirical Train Delay Data

Due to lack of punctuality of public transport services, travel times of passengers are often uncertain. Whereas Automatic Vehicle Location (AVL) data makes it easy to measure the punctuality of public transport vehicles themselves, calculating door-to-door passenger delays is challenging as both the intended and realised routes of passengers have to be taken into account. This study introduces an agent-based MATSim simulation framework for evaluating passenger delays caused by delayed trains in multi-modal public transport systems. Three route choice strategies based on different levels of adaptiveness are considered, allowing passengers to intelligently deviate from their intended routes. Using empirical train delay data from the metropolitan area of Copenhagen for 65 weekdays in the autumn of 2014, the model concludes that the passenger delay distribution has a considerably higher standard deviation than the delay distribution of train arrivals. Additionally, the results reveal that a typical realised timetable would allow reduced overall passenger travel time compared to the published timetable.

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